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A multicentre cross-sectional study of the prevalence and predictors of depression and anxiety among caregivers of children with sickle cell disease in Abia State, Nigeria

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Abstract

Background/Objective: Sickle cell disease (SCD) exacts a heavy psychosocial toll on caregivers in resource-limited settings like Nigeria, where mental health integration in paediatric care remains sparse. This study assessed the prevalence and predictors of depression and anxiety among family caregivers of children with SCD in Abia State, aiming to inform targeted public health interventions.

Methods: A multicentre cross-sectional study was conducted from June to August 2025 at three referral hospitals in Abia State, Nigeria. Using consecutive sampling, 384 eligible primary caregivers (≥18 years) of children (<18 years) with confirmed SCD were interviewed. Depression and anxiety were screened using the Patient Health Questionnaire-9 (PHQ-9; cutoff ≥10) and Generalised Anxiety Disorder-7 (GAD-7; cutoff ≥10). Sociodemographic, caregiving, and disease-related variables were collected through structured questionnaires. Multivariable logistic regression identified predictors ($p<0.05$), adhering to STROBE guidelines. Ethical approval was secured from the Abia State Health Research Ethics Committee (AB/MH/PRS/ECS/T.1/1016).

Results: Participants were predominantly female (78.4%) and mothers (75.3%), with a mean age of 36.4 years (SD 7.2); 66.7% had monthly incomes <₦50,000 (<$35). Depression prevalence was 41.7% (95% CI: 36.9-46.5) and anxiety 35.2% (95% CI: 30.6-39.8), with 28.1% comorbidity. Independent predictors of depression included low income (OR=2.45, 95% CI: 1.62-3.71), caregiving >5 years (OR=1.89, 95% CI: 1.24-2.88), and child hospitalizations ≥3/year (OR=2.12, 95% CI: 1.41-3.19). For anxiety, female gender (OR=1.67, 95% CI: 1.05-2.65) and rural residence (OR=1.74, 95% CI: 1.12-2.70) were significant (Nagelkerke R^2=0.25-0.28).

Conclusion: High depression and anxiety burdens among SCD caregivers in Abia State are driven by socioeconomic and clinical stressors. Routine mental health screening and subsidised support programmes are essential to bolster caregiver resilience and optimise child SCD outcomes in Nigeria.

Keywords: Sickle cell disease, caregivers, depression, anxiety disorders, cross-sectional studies, Nigeria, mental health

Introduction

Sickle cell disease (SCD) remains a major global public health challenge, particularly in low- and middle-income countries where access to comprehensive care is limited. In 2021, an estimated 7.74 million people lived with SCD worldwide, with approximately 515,000 new births annually, and sub-Saharan Africa bearing nearly 80% of the global burden (WHO, 2025) [28]. Nigeria is home to the largest SCD population globally and accounts for about 25% of affected individuals, translating to over 150,000 annual births with the condition and contributing to substantial under-5 mortality, estimated at 81,100 deaths in 2021 alone (Nwabuko *et al*., 2022; WHO, 2025) [22, 28]. The chronic nature of SCD, characterised by recurrent vaso-occlusive crises, acute chest syndrome, and organ damage, not only impairs quality of life for affected children but also imposes profound physical, emotional, and socioeconomic strains on their families (Elendu *et al*., 2023) [13].

Caregivers, predominantly mothers in resource-constrained settings, bear the brunt of this burden, often juggling intensive medical regimens, financial hardships, and disrupted daily routines without adequate support systems. A systematic review by Bruzzese *et al*. (2023) [7] highlighted that mental health disorders, including depression and anxiety, are prevalent among SCD caregivers, with rates of depressive symptoms ranging from 15.8% to 34.7% and anxiety from 13% to 21%, exceeding clinical thresholds. These conditions are exacerbated by factors such as frequent hospitalisations, stigma, and economic instability, leading to poorer adherence to treatment protocols and adverse child outcomes, including increased pain episodes, functional disability, and healthcare utilisation (Bruzzese *et al*., 2023; Marlow *et al*., 2022) [7, 18]. In African contexts, where formal mental health services are scarce, the psychosocial toll is amplified; for instance, a cross-sectional study in Cameroon reported a 50% prevalence of significant depressive symptoms among SCD caregivers, independently associated with diminished family quality of life due to high out-of-pocket costs for medications and crisis management (Appiah *et al*., 2020; Bruzzese *et al*., 2023; Monono, 2023) [6, 7, 19].

In Nigeria, the epicentre of the SCD epidemic, caregivers face compounded challenges amid limited national screening programmes and subsidised care. Qualitative explorations in northern Ghana, a comparable setting, highlighting themes of financial exhaustion from uncovered costs (e.g., blood transfusions and analgesics), employment disruptions, and emotional distress from witnessing unrelenting child suffering, with many reporting isolation and adjustment difficulties post-diagnosis (Afoko *et al*., 2022) [4]. Local evidence from north-central Nigeria reveals that 66.5% of caregivers experience severe financial impacts, including income loss and loans, alongside routine disruptions affecting 79.4% of families and emotional

strains like sorrow or depression in 59.4% (Akande *et al*., 2023) [5]. Earlier studies in Lagos and southwestern regions corroborate this, documenting depression or sorrow in up to 80.6% of caregivers, alongside 91.2% reporting income losses and 96.8% noting tense home atmospheres (Daliri *et al*., 2024; Makanjuola & Ngcobo, 2025; Okeke *et al*., 2020) [9, 17, 23]. Predictors such as prolonged caregiving duration, low socioeconomic status, and recurrent child hospitalisations emerge consistently in research, yet data remain fragmented, with most research concentrated in urban or northern centres (Rasul *et al*., 2019) [25].

Despite these insights, critical gaps persist in understanding the mental health burden in southeastern Nigeria, including Abia State, where rural-urban disparities, cultural stigmas, and overburdened referral hospitals may intensify vulnerabilities (Kalu *et al*., 2025) [16]. Abia, with its high SCD carrier rates (approaching 25%), lacks region-specific prevalence estimates or predictor analyses, hindering tailored interventions like community-based screening or resilience-building programmes (Nwabuko *et al*., 2022) [22]. Addressing this requires robust, multicentre data to inform policy, aligning with Nigeria's National Health Act mandates for integrated and family-centred care.

This multicentre cross-sectional study therefore aimed to determine the prevalence of depression and anxiety among family caregivers of children with SCD attending referral hospitals in Abia State, Nigeria, and to identify sociodemographic, clinical, and disease-related predictors. By elucidating these patterns, our findings seek to guide public health strategies for mitigating caregiver distress and enhancing paediatric SCD management in underserved regions.

Methods

Study Design

This multicentre cross-sectional study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for cross-sectional research (Cuschieri, 2019; Elm *et al*., 2025) [8, 14]. Data collection occurred between June and August 2025, using a structured questionnaire administered using face-to-face interviews.

Setting

The study was conducted at three major referral hospitals in Abia State, southeastern Nigeria. These facilities serve as tertiary centres for paediatric sickle cell disease (SCD) management, handling an estimated 500-800 SCD cases annually across urban and rural catchment areas with high SCD prevalence (carrier rates of 20-25%; David *et al*., 2018; Davies & Oni, 1997) [10, 11]. Participants were recruited from paediatric haematology clinics and inpatient wards during routine follow-up visits or admissions.

Participants

Eligible participants were primary caregivers (aged ≥18 years) responsible for the day-to-day care of children (<18 years) with confirmed SCD (homozygous HbSS or compound heterozygous HbSC, verified by haemoglobin electrophoresis at diagnosis). Exclusion criteria included caregivers with self-reported severe cognitive impairment, non-primary caregivers, or those unable to complete the interview due to acute illness. A consecutive sampling strategy was employed, approaching all eligible caregivers during clinic hours until the target sample size was achieved, to enhance representativeness and minimise selection bias.

Variables

The primary outcomes were clinically significant depression and anxiety. Depression was assessed using the Patient Health Questionnaire-9 (PHQ-9), a 9-item self-report scale scoring 0–27, with a cutoff of ≥10 indicating moderate-to-severe symptoms [sensitivity 88%, specificity 88% in Nigerian populations; (Adewuya *et al*., 2006)] [3]. Anxiety was measured with the Generalised Anxiety Disorder-7 (GAD-7) scale, a 7-item tool scoring 0-21, with a cutoff of ≥10 denoting moderate-to-severe anxiety (sensitivity 89%, specificity 82%; Mbanuzuru *et al*., 2023) [27]. Comorbid depression-anxiety was defined as scoring above the cutoff on both scales.

Predictor variables included sociodemographic factors (caregiver age, gender, education level, marital status, monthly household income in Nigerian naira [₦], and rural/urban residence), caregiving characteristics (duration in years, relationship to child), and disease-related factors (child age at diagnosis, SCD genotype, and frequency of hospitalisations in the past year [categorised as 0, 1-2, ≥3]). These were selected based on prior associations with caregiver mental health in SCD contexts (Bruzzese *et al*., 2023) [7].

Data Sources and Measurement

Data were collected using a pre-tested, structured interviewer-administered questionnaire adapted from validated instruments in Nigerian SCD studies (Adewuya *et al*., 2006; Olaluwoye *et al*., 2023; Ugwu *et al*., 2025) [3, 24, 26]. The tool was made up of three sections: sociodemographic (8 items), caregiving/disease history (6 items), and mental health scales (PHQ-9 and GAD-7). Interviews, lasting 15-20 minutes, were conducted in English or Igbo (the predominant local language) by five trained research assistants (nurses with bachelor's degrees) in a private clinic space to ensure confidentiality. Tools were translated and back-translated following WHO guidelines, with pilot testing on 30 non-study caregivers (Cronbach's alpha = 0.85 for PHQ-9; 0.82 for GAD-7). Responses were recorded on paper forms and double-entered into a secure electronic database.

Bias

Selection bias was addressed through consecutive recruitment across multiple sites and time periods to capture diverse clinic attendees. Information bias was minimised by using validated, standardised scales administered by trained interviewers, with inter-rater reliability checked using 10% audio-recorded sessions ($\kappa = 0.92$). Recall bias for disease factors was mitigated by cross-verification with medical records where available (80% of cases). No differential loss to follow-up occurred, as this was a one-time cross-sectional assessment.

Study Size

The sample size was calculated for estimating depression prevalence, the primary outcome, using the formula for single proportion:

$$n = \frac{Z^2 \cdot p \cdot (1-p)}{d^2}$$

Where Z = 1.96 (95% confidence interval), p = 0.30 (anticipated prevalence from prior Nigerian studies; Bruzzese *et al*., 2023) [7], and d = 0.05 (margin of error), yielding n = 323. A non-response factor of 20% accounted for non-response and incomplete data, resulting in a target of 384 participants.

Statistical Methods

Data were analysed using IBM SPSS Statistics version 31.0 (IBM Corp., Armonk, NY). Descriptive statistics summarised participant characteristics: continuous variables as means ± standard deviations (normality assessed using the Shapiro-Wilk test) and categorical variables as frequencies (percentages). Bivariable associations between predictors and outcomes were examined using chi-square tests/Fisher's exact tests for categorical data and independent t-tests/Mann-Whitney U tests for continuous data ($p < 0.05$ threshold).

Multivariable logistic regression models (separate for depression and anxiety) used forward stepwise selection to identify independent predictors, with adjusted odds ratios (OR) and 95% confidence intervals (CI) reported. Variables with $p < 0.20$ in bivariable analyses were candidates for inclusion, adjusted for potential confounders (e.g., age, gender). Model goodness-of-fit was evaluated using the Hosmer-Lemeshow test ($p > 0.05$ indicating adequacy) and Nagelkerke R^2. Multicollinearity was assessed using variance inflation factors (<5). Subgroup analyses explored rural-urban differences. Statistical significance was set at $p < 0.05$ (two-tailed).

Ethical Considerations

Ethical approval was obtained from the Abia State Ministry of Health's Health Research Ethics Committee (approval number: AB/MH/PRS/ECS/T.1/1016), and permission was secured from the heads of the referral facilities prior to commencement. All caregivers provided written informed consent after full disclosure. Data were anonymised, stored securely, and accessible only to the research team.

Results

Of 412 eligible caregivers approached across the three referral hospitals, 384 (93.2%) provided consent and completed interviews, with 28 exclusions due to refusal (n=20) or incomplete data (n=8). Recruitment was evenly distributed: 128 (33.3%) from Federal Medical Centre Umuahia, 128 (33.3%) from Abia State Specialist Hospital and Diagnostic Centre Umuahia, and 128 (33.3%) from Madonna Hospital and Maternity Umuahia. Participant characteristics are summarised in Table 1.

Table 1: Characteristics of caregivers and their children with sickle cell disease (n=384)

Caregiver characteristics	n (%) or Mean±SD
Age (years)	36.4 ± 7.2
Female sex	301 (78.4)
Marital status: Married/partnered	312 (81.3)
Education: Primary/secondary or less	240 (62.5)
Monthly household income: <₦50,000	256 (66.7)
Residence: Rural	192 (50.0)
Relationship to child: Mother	289 (75.3)
Caregiving duration (years)	6.2 ± 3.1
Child characteristics	
Age (years)	7.8 ± 4.1
Age at diagnosis (years)	1.9 ± 1.2
Genotype: HbSS	312 (81.3)
Hospitalizations in past year: ≥3	144 (37.5)

The prevalence of clinically significant depression (PHQ-9 ≥10) was 160/384 (41.7%; 95% CI 36.9 to 46.5), and for anxiety (GAD-7 ≥10) it was 135/384 (35.2%; 95% CI 30.6 to 39.8). Comorbid depression and anxiety were observed in 108/384 (28.1%; 95% CI 23.7 to 32.5). Figure 1 illustrates the distribution of symptom severity scores for both scales.

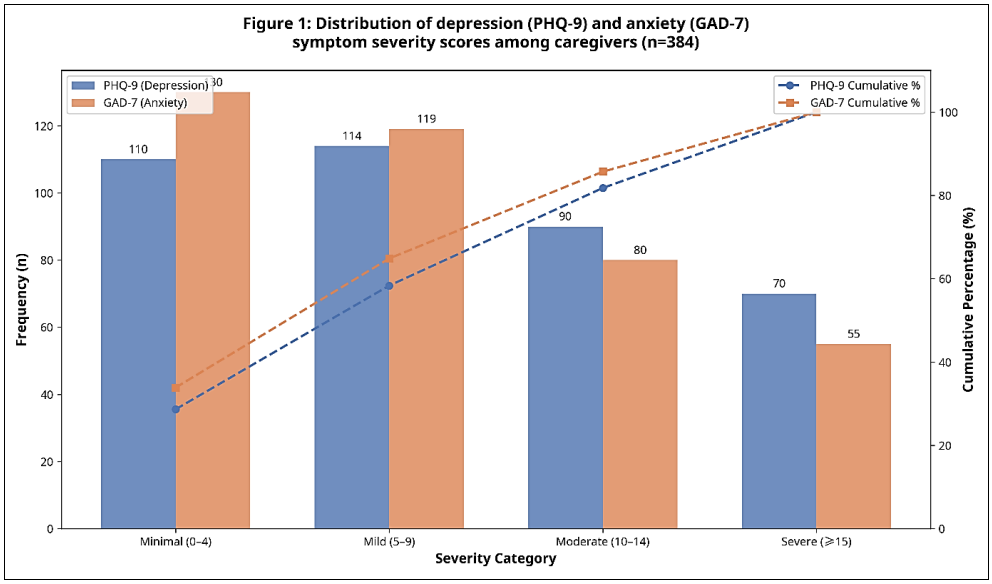


Figure 1: Distribution of depression (PHQ-9) and anxiety (GAD-7) symptom severity scores among caregivers (n=384)

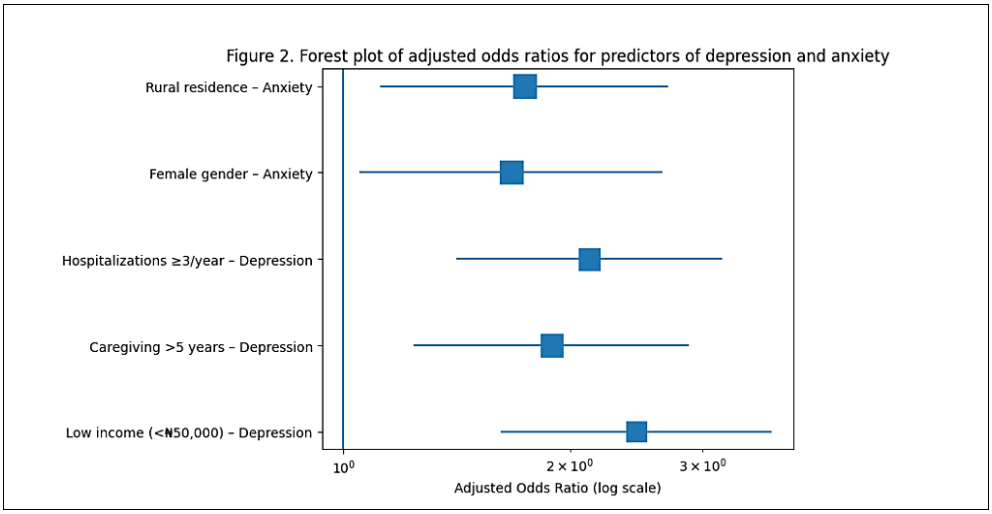
Bivariable analyses revealed significant associations between potential predictors and outcomes (Table 2). For depression, lower education (p=0.003), income <₦50,000 (p<0.001), rural residence (p=0.012), caregiving >5 years (p=0.002), and child hospitalisations ≥3/year (p<0.001) were associated. For anxiety, female gender (p=0.029), rural residence (p=0.004), and child hospitalisations ≥3/year (p=0.017) showed associations. No significant differences emerged by child age, genotype, or caregiver marital status (all p>0.05).

Table 2: Bivariable associations between predictors and depression/anxiety (n=384)

Characteristics	Depression (PHQ-9 ≥10)	p-value	Anxiety (GAD-7 ≥10)	p-value
Caregiver age (continuous)	-	0.124	-	0.089
Female sex	128/301 (42.5%)	0.321	112/301 (37.2%)	0.029
Education: Primary/secondary or less	112/240 (46.7%)	0.003	96/240 (40.0%)	0.071
Income: <₦50,000	184/256 (71.9%)	<0.001	152/256 (59.4%)	0.112
Residence: Rural	104/192 (54.2%)	0.012	88/192 (45.8%)	0.004
Caregiving duration: >5 years	96/224 (42.9%)	0.002	80/224 (35.7%)	0.241
Child hospitalizations: ≥3/year	80/144 (55.6%)	<0.001	64/144 (44.4%)	0.017

In multivariable logistic regression models, independent predictors of depression were low monthly income (adjusted OR 2.45, 95% CI 1.62 to 3.71; p<0.001), caregiving duration >5 years (adjusted OR 1.89, 95% CI 1.24 to 2.88; p=0.003), and child hospitalisations ≥3/year (adjusted OR 2.12, 95% CI 1.41 to 3.19; p<0.001). The model showed good fit (Hosmer-Lemeshow p=0.742; Nagelkerke R^2=0.28). For anxiety, female gender (adjusted OR 1.67, 95% CI 1.05 to 2.65; p=0.031) and rural residence (adjusted OR 1.74, 95% CI 1.12 to 2.70; p=0.014) remained significant, with adequate fit (Hosmer-Lemeshow p=0.856; Nagelkerke R^2=0.25).

Subgroup analyses indicated higher depression prevalence in rural (48.4%) versus urban (35.0%) caregivers (p=0.003) and greater anxiety among mothers (38.1%) compared to fathers/others (24.5%; p=0.012). No significant site-specific differences were observed (p>0.05 for all comparisons). Forest plots of adjusted odds ratios are presented in Figure 2.



Discussion

Summary of Key Findings

In this multicentre cross-sectional study conducted across three referral hospitals in Abia State, Nigeria, we found a high prevalence of clinically significant depression (41.7%) and anxiety (35.2%) among family caregivers of children with sickle cell disease (SCD), with nearly one-third (28.1%) experiencing comorbid symptoms. These rates were independently predicted by socioeconomic stressors (e.g., low monthly income <₦50,000 (<$35) for depression; OR 2.45, 95% CI 1.62 to 3.71) and disease-related burdens (e.g., caregiving duration >5 years and frequent child hospitalisations ≥3/year for depression; ORs 1.89 and 2.12, respectively), alongside gender (female; OR 1.67 for anxiety) and rural residence (OR 1.74 for anxiety). Participant characteristics reflected typical SCD caregiving profiles: predominantly female (78.4%), mothers (75.3%), with a mean age of 36.4 years (SD 7.2), low education (62.5% primary/secondary or less), and half residing rurally. Children were young (mean age 7.8 ± 4.1 years), mostly of the HbSS genotype (81.3%), with 37.5% hospitalised ≥3 times in the prior year.

Regarding participant flow, of 412 eligible caregivers identified through consecutive sampling during clinic visits, 384 (93.2%) were successfully interviewed after providing informed consent. Exclusions comprised 20 refusals (primarily citing time constraints) and 8 incomplete responses (due to interview interruptions), yielding a low nonresponse rate that supports study robustness. No significant differences in basic demographics (e.g., age, gender) were noted between included and excluded participants based on screening logs (p>0.05), minimising selection bias.

Comparison with Existing Literature

Our prevalence estimates align with, yet exceed, global systematic reviews reporting depressive symptoms in 15.8-34.7% and anxiety in 13-21% of SCD caregivers,

particularly in low-resource settings where structural barriers amplify distress (Bruzzese *et al*., 2023) [7]. In sub-Saharan Africa, comparable rates emerge: Cameroonian studies documented up to 50% depressive symptoms among caregivers of chronically ill children, linked to out-of-pocket costs mirroring our income predictor (Ekoube *et al*., 2024; Ngang *et al*., 2025) [12, 21]. Nigerian evidence from north-central regions shows similar psychosocial burdens, with 59.4% emotional strain and 66.5% financial impacts, though our southeastern focus highlights regional nuances like rural-urban disparities (Abdulkadir *et al*., 2024) [1]. The strong association with frequent hospitalisations echoes findings from southwestern Nigeria, where crisis episodes doubled depression risk (Fetuga *et al*., 2020) [15], highlighting SCD's episodic toll.

Gender and residence as anxiety predictors resonate with broader caregiver literature; women, often primary caregivers, face compounded roles in patriarchal contexts (Mumuni *et al*., 2023) [20]. Rural elevations (45.8% anxiety prevalence vs. urban) may reflect Abia's transport challenges and service gaps, contrasting urban-biased studies (Adegoke & Kuteyi, 2012) [2]. Prolonged caregiving (>5 years) as a depression risk factor extends qualitative insights from Ghana, where chronic adjustment fatigue erodes resilience (Mumuni *et al*., 2023) [20]. Notably, our comorbid rate (28.1%) surpasses isolated estimates, signalling intertwined mental health pathways warranting holistic screening (Bruzzese *et al*., 2023) [7].

Strengths and Limitations

Strengths include the multicentre design across urban/semi-rural sites, enhancing generalisability within Abia State, and the high response rate (93.2%) using trained interviewers, reducing information bias (inter-rater κ=0.92). Consecutive sampling from diverse clinic attendees (evenly distributed: 33.3% per site) captured representative characteristics, with verification against medical records for 80% of disease data to mitigate recall issues. Validated tools (PHQ-9, GAD-7) were culturally adapted, with strong psychometrics in Nigerian studies. The limitations are the cross-sectional design, which does not determine causality; the self-reported data which, despite standardisation and private interviewing, may under/overestimate symptoms due to stigma; and the focus on referral hospitals, which may overlook community-managed cases, potentially inflating hospitalisation rates.

Conclusion

This multicentre cross-sectional study highlights the substantial mental health burden borne by family caregivers of children with sickle cell disease in Abia State, Nigeria, revealing high prevalences of depression (41.7%) and anxiety (35.2%), compounded by comorbid symptoms in 28.1% of participants and driven by modifiable predictors including low socioeconomic status, prolonged caregiving, recurrent child hospitalisations, female gender, and rural residence. These findings highlight the urgent need for integrated, family-centred intervention, including routine PHQ-9 and GAD-7 screening in paediatric clinics, subsidised crisis management to alleviate financial strain, and community-based resilience programmes tailored to southeastern Nigeria's cultural and geographic contexts to mitigate caregiver distress, enhance treatment adherence, and improve child outcomes. By addressing these gaps within Nigeria's National Sickle Cell Policy framework, public health efforts can foster equitable care ecosystems, ultimately reducing the intergenerational toll of SCD in high-burden regions and aligning with global calls for holistic chronic disease support.

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